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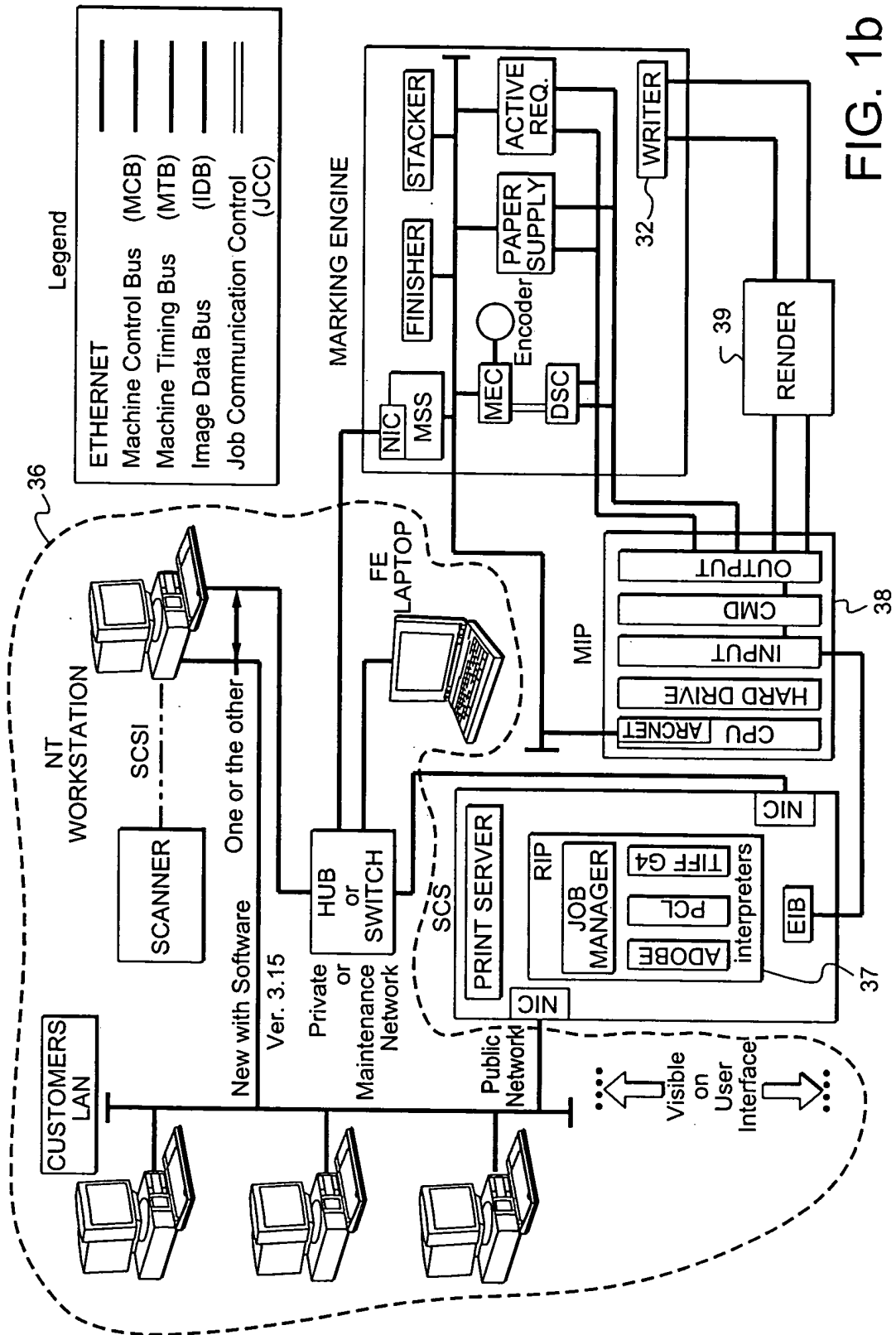
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Algorithm Block Diagram

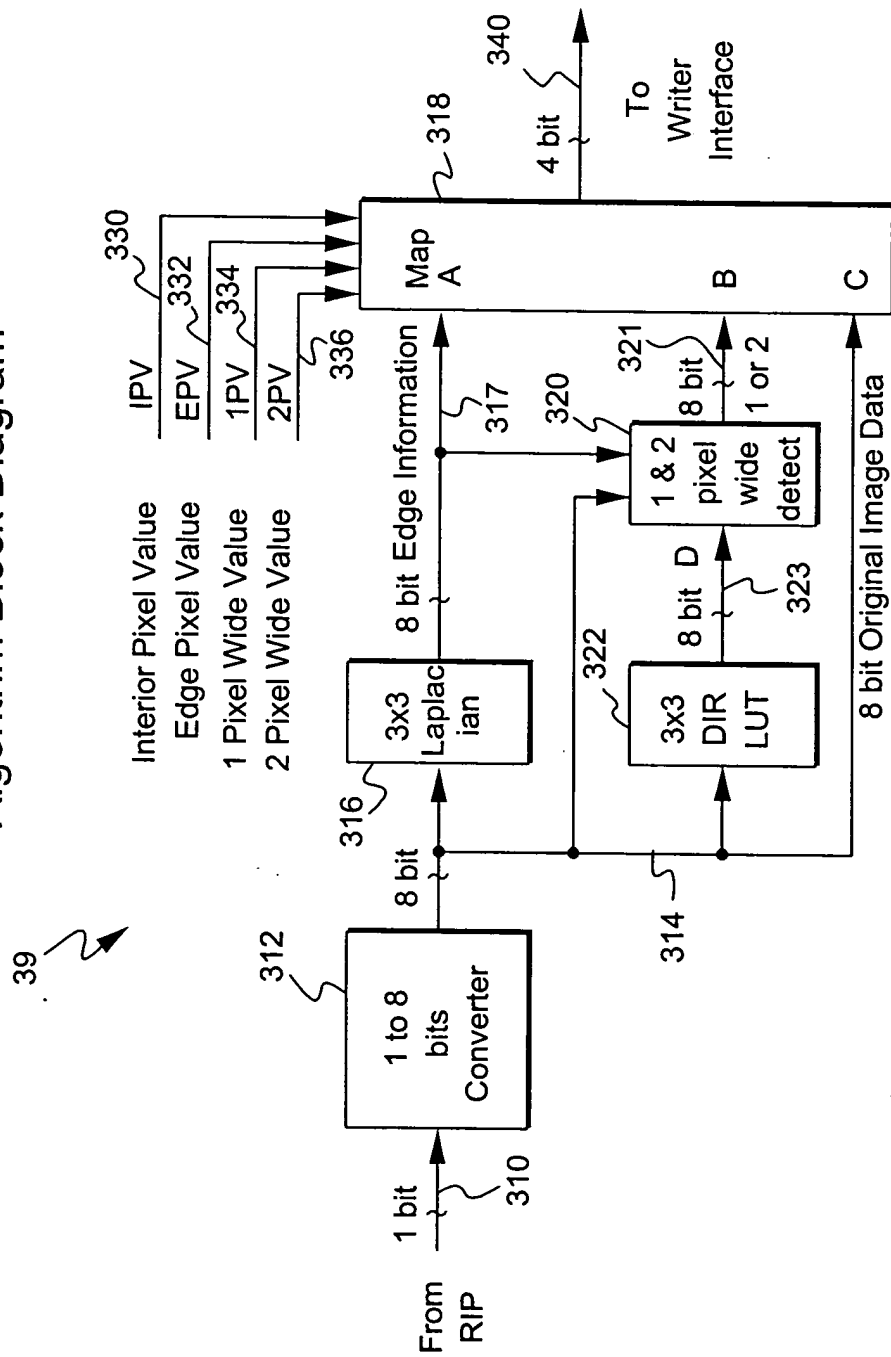


FIG. 2

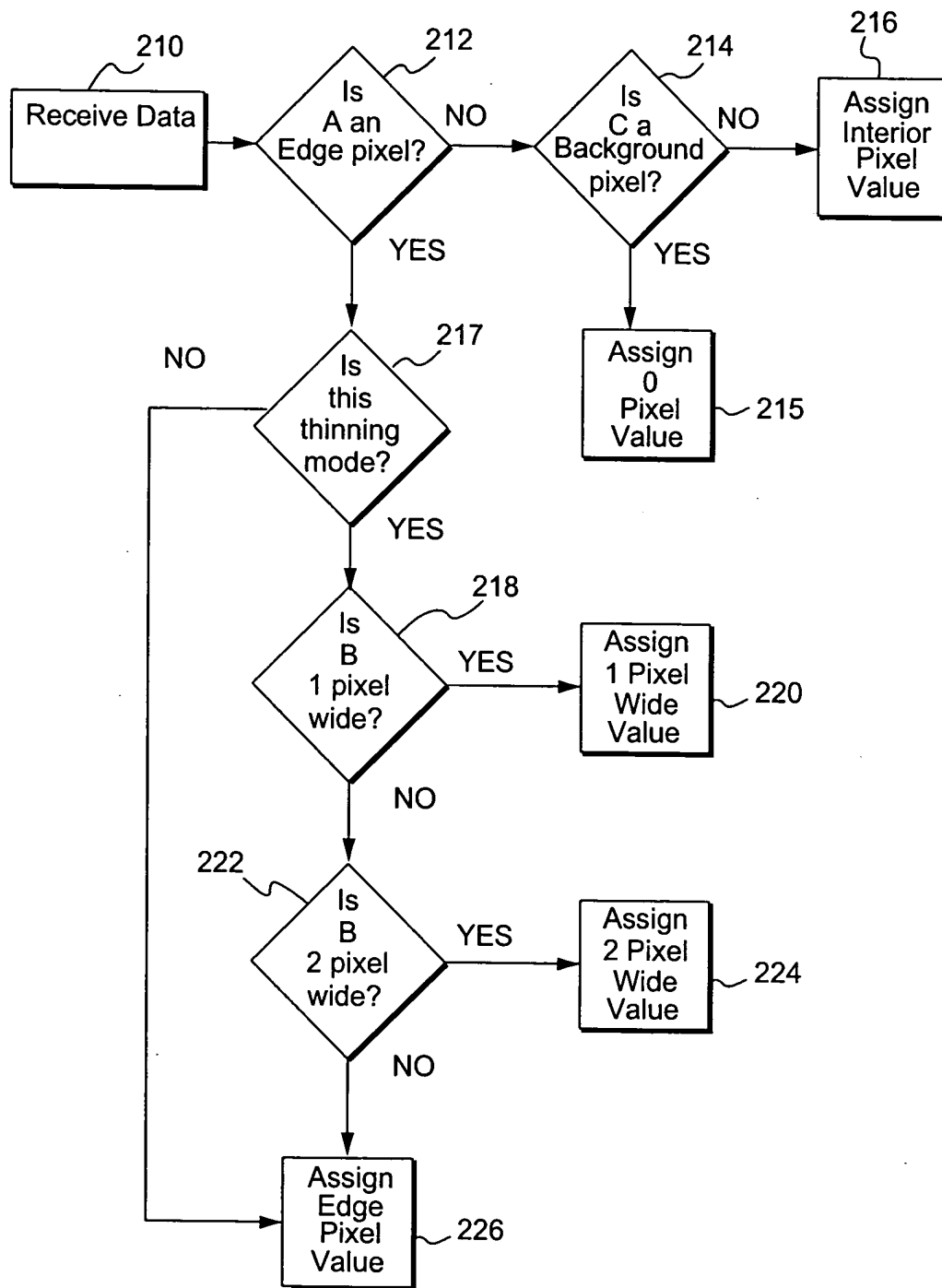
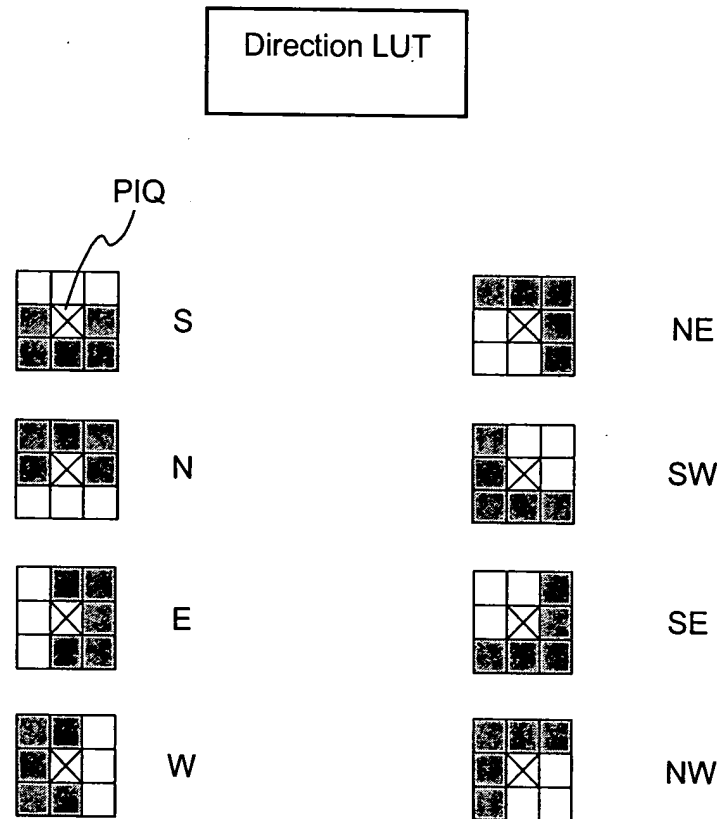
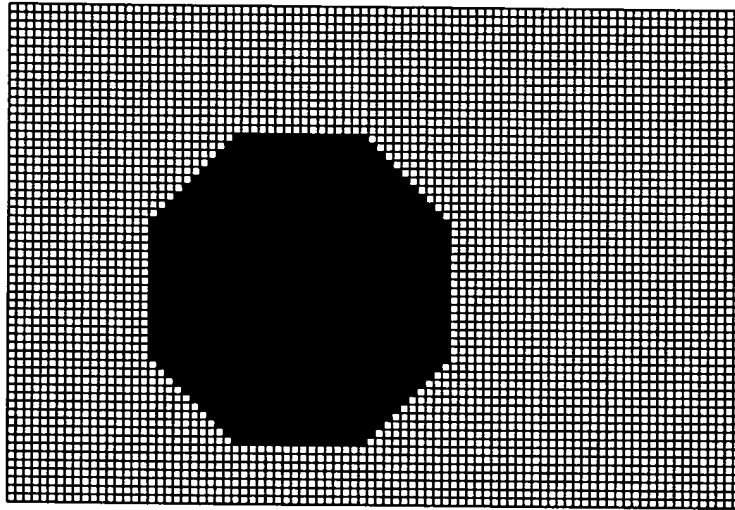


FIG. 3



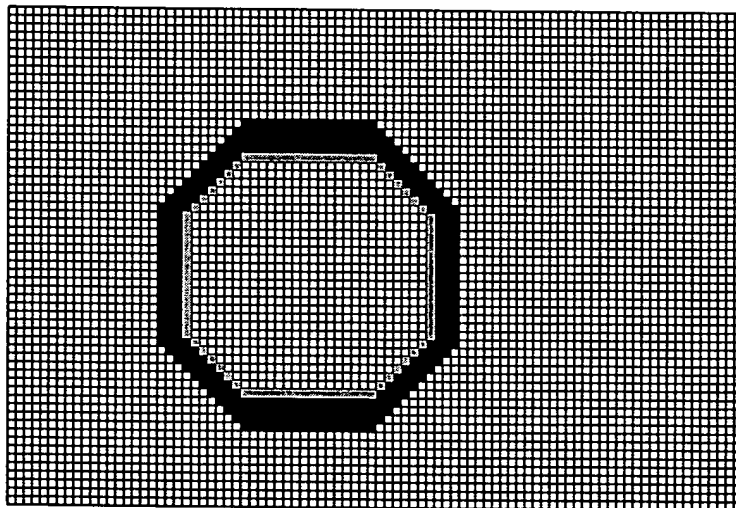
All other combinations result in zero.

FIG. 4



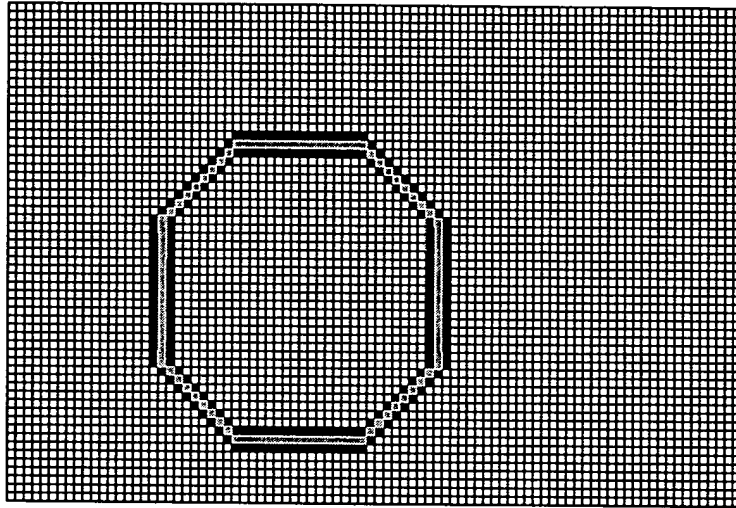
Original object
bitmap

FIG. 5a



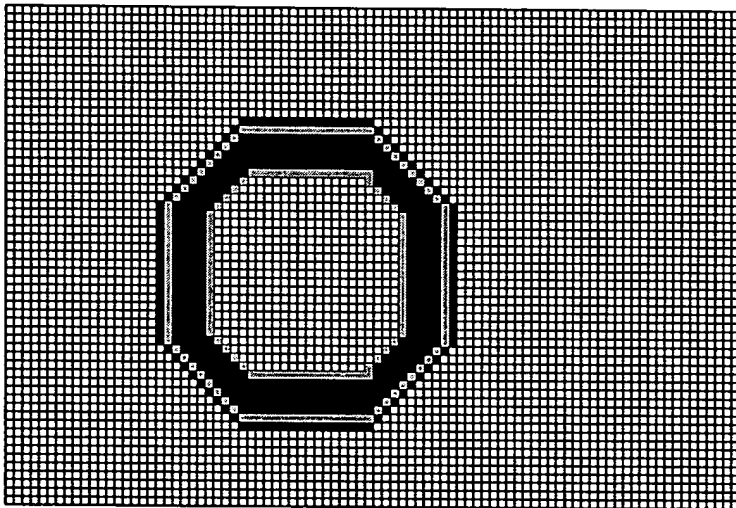
Four onion skin
layers when thinning

FIG. 5b



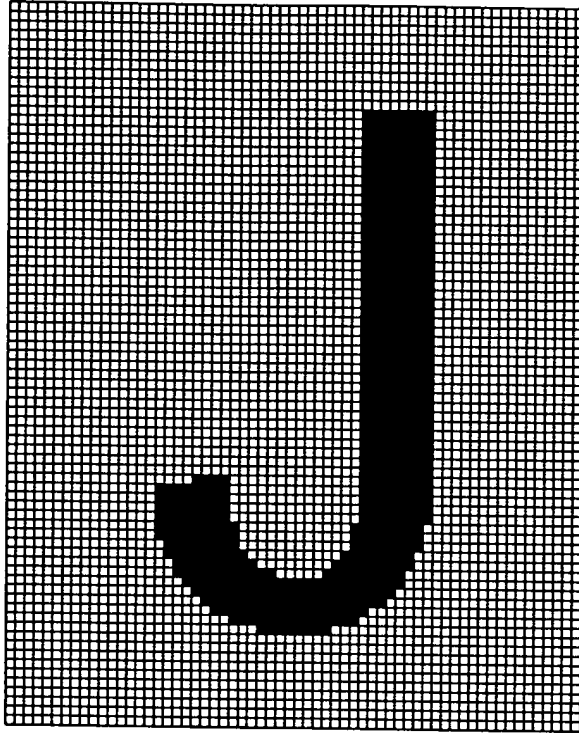
Three onion
skin layers when
thickening

FIG. 5c



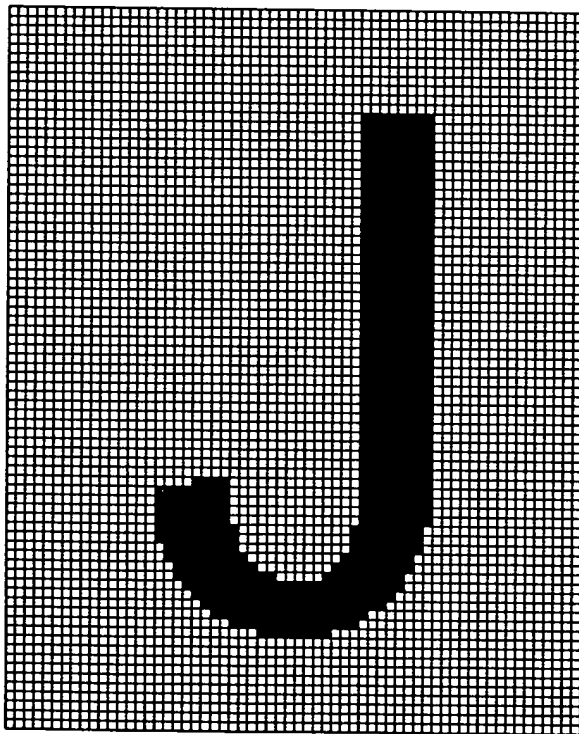
All layers
(thickening and
thinning)

FIG. 5d



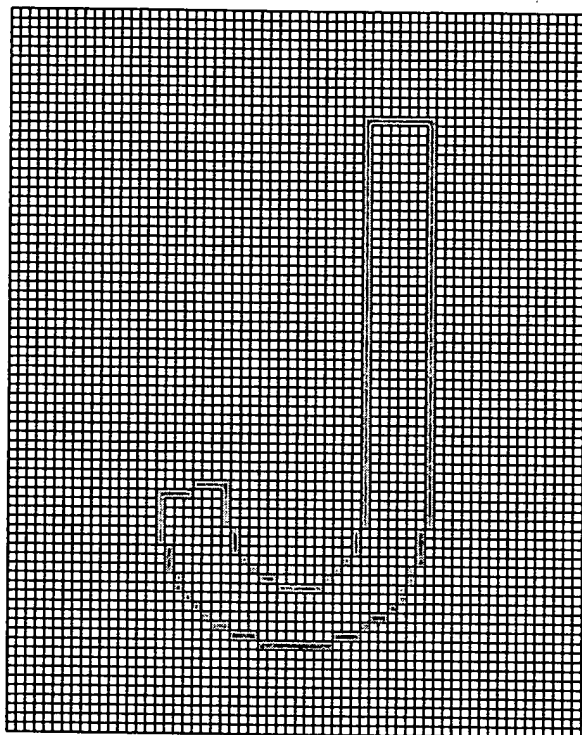
Original
Binary Bitmap

FIG. 6a



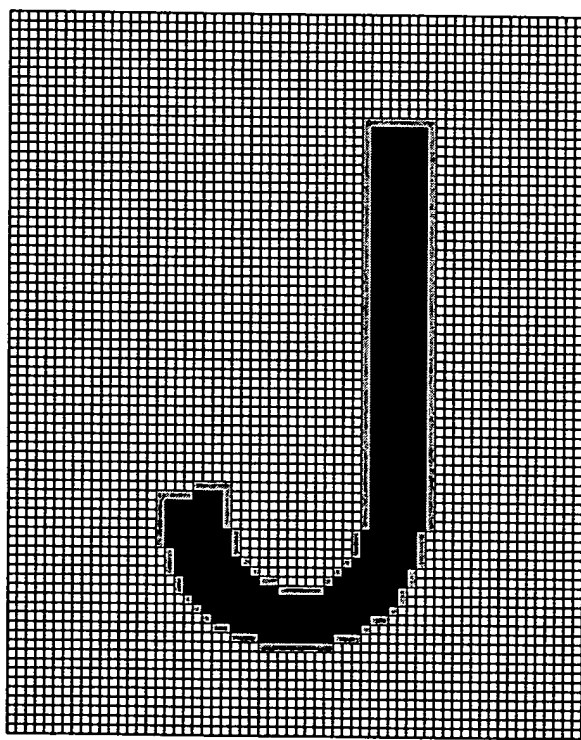
Same grey level pixel value
value assigned to edges
and solid area density

FIG. 6b



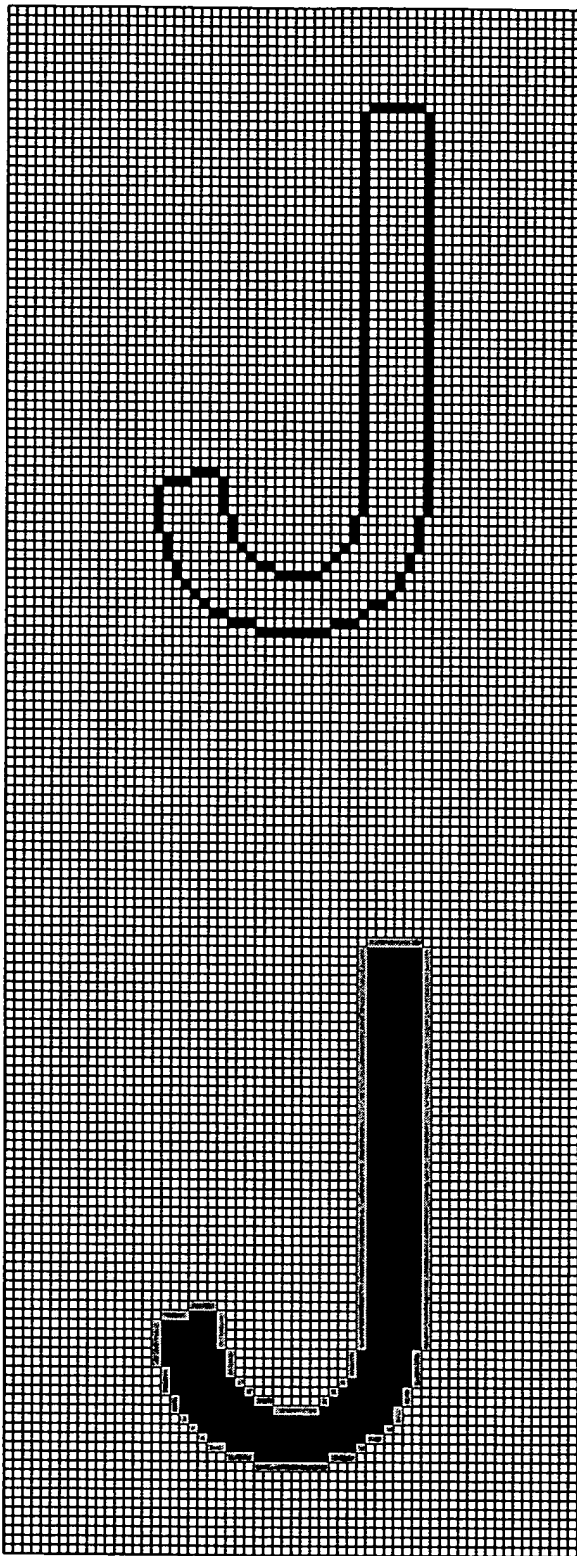
Edges
when thinning

FIG. 6c



Lightened-
Solid area density reduced
Letter thinner

FIG. 6d



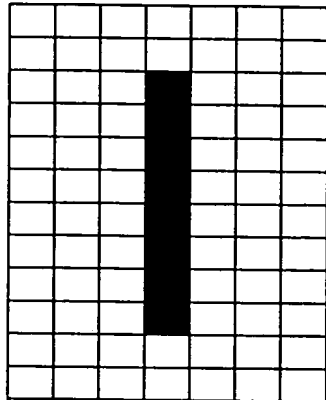
Edges
when thickening

FIG. 6e

Thickened
Letter thickened by applying
gray to edges which were
originally white

FIG. 6f

1 Pixel Wide Detection



Original 1 pixel wide line

FIG. 7a

0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	255	0	0	0
0	0	0	255	0	0	0
0	0	0	255	0	0	0
0	0	0	255	0	0	0
0	0	0	255	0	0	0
0	0	0	255	0	0	0
0	0	0	255	0	0	0
0	0	0	255	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0

Edge Pixels

FIG. 7b

0	0	0	0	0	0	0
0	0	SE	S	SW	0	0
0	0	E	S	W	0	0
0	0	E	0	W	0	0
0	0	E	0	W	0	0
0	0	E	0	W	0	0
0	0	E	0	W	0	0
0	0	E	0	W	0	0
0	0	E	0	W	0	0
0	0	E	0	W	0	0
0	0	E	N	W	0	0
0	0	NE	N	NW	0	0
0	0	0	0	0	0	0

Direction Values

FIG. 7c

BP	BP	BP	BP	BP	BP	BP
BP	BP	BP	BP	BP	BP	BP
BP	BP	BP	EP	BP	BP	BP
BP	BP	BP	1W	BP	BP	BP
BP	BP	BP	1W	BP	BP	BP
BP	BP	BP	1W	BP	BP	BP
BP	BP	BP	1W	BP	BP	BP
BP	BP	BP	1W	BP	BP	BP
BP	BP	BP	1W	BP	BP	BP
BP	BP	BP	EP	BP	BP	BP
BP	BP	BP	BP	BP	BP	BP
BP	BP	BP	BP	BP	BP	BP

Assignment

BP: Background Pixel

EP: Edge Pixel

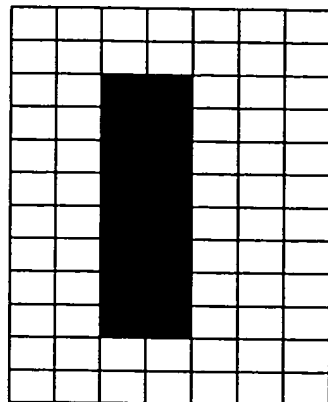
1W: One Pixel Wide Line

FIG. 7d

2 Pixel Wide Detection

Original 2 pixel wide line

FIG. 8a



Edge Pixels

FIG. 8b

0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	255	255	0	0	0	0
0	0	255	255	0	0	0	0
0	0	255	255	0	0	0	0
0	0	255	255	0	0	0	0
0	0	255	255	0	0	0	0
0	0	255	255	0	0	0	0
0	0	255	255	0	0	0	0
0	0	255	255	0	0	0	0
0	0	255	255	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

Direction Values

FIG. 8c

0	0	0	0	0	0	0	0
0	SE	S	S	SW	0	0	0
0	E	SE	SW	W	0	0	0
0	E	E	W	W	0	0	0
0	E	E	W	W	0	0	0
0	E	E	W	W	0	0	0
0	E	E	W	W	0	0	0
0	E	E	W	W	0	0	0
0	E	E	W	W	0	0	0
0	E	NE	NW	W	0	0	0
0	NE	N	N	NW	0	0	0
0	0	0	0	0	0	0	0

Assignment

FIG. 8d

BP: Background Pixel

EP: Edge Pixel

2W: Two Pixel Wide Line

BP	BP	BP	BP	BP	BP	BP	BP
BP	BP	BP	BP	BP	BP	BP	BP
BP	BP	EP	EP	BP	BP	BP	BP
BP	BP	2W	2W	BP	BP	BP	BP
BP	BP	2W	2W	BP	BP	BP	BP
BP	BP	2W	2W	BP	BP	BP	BP
BP	BP	2W	2W	BP	BP	BP	BP
BP	BP	2W	2W	BP	BP	BP	BP
BP	BP	2W	2W	BP	BP	BP	BP
BP	BP	EP	EP	BP	BP	BP	BP
BP	BP	BP	BP	BP	BP	BP	BP
BP	BP	BP	BP	BP	BP	BP	BP

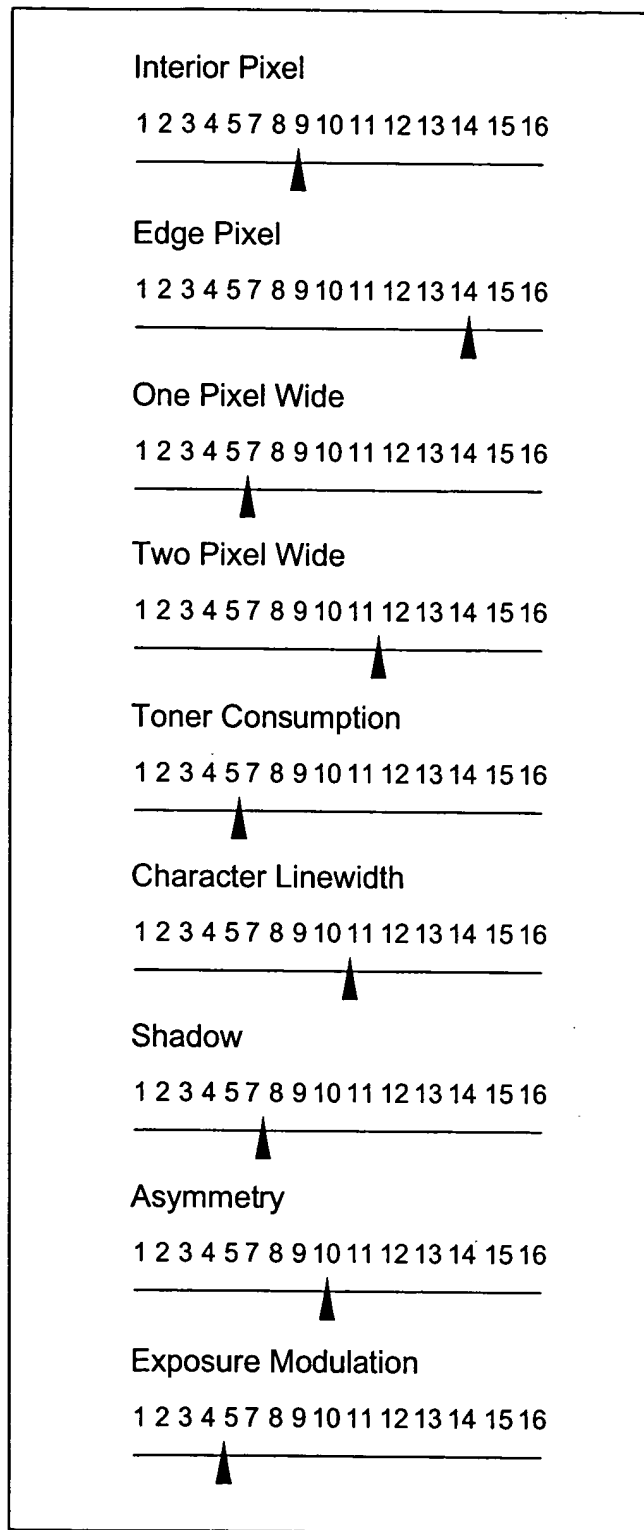


FIG. 9

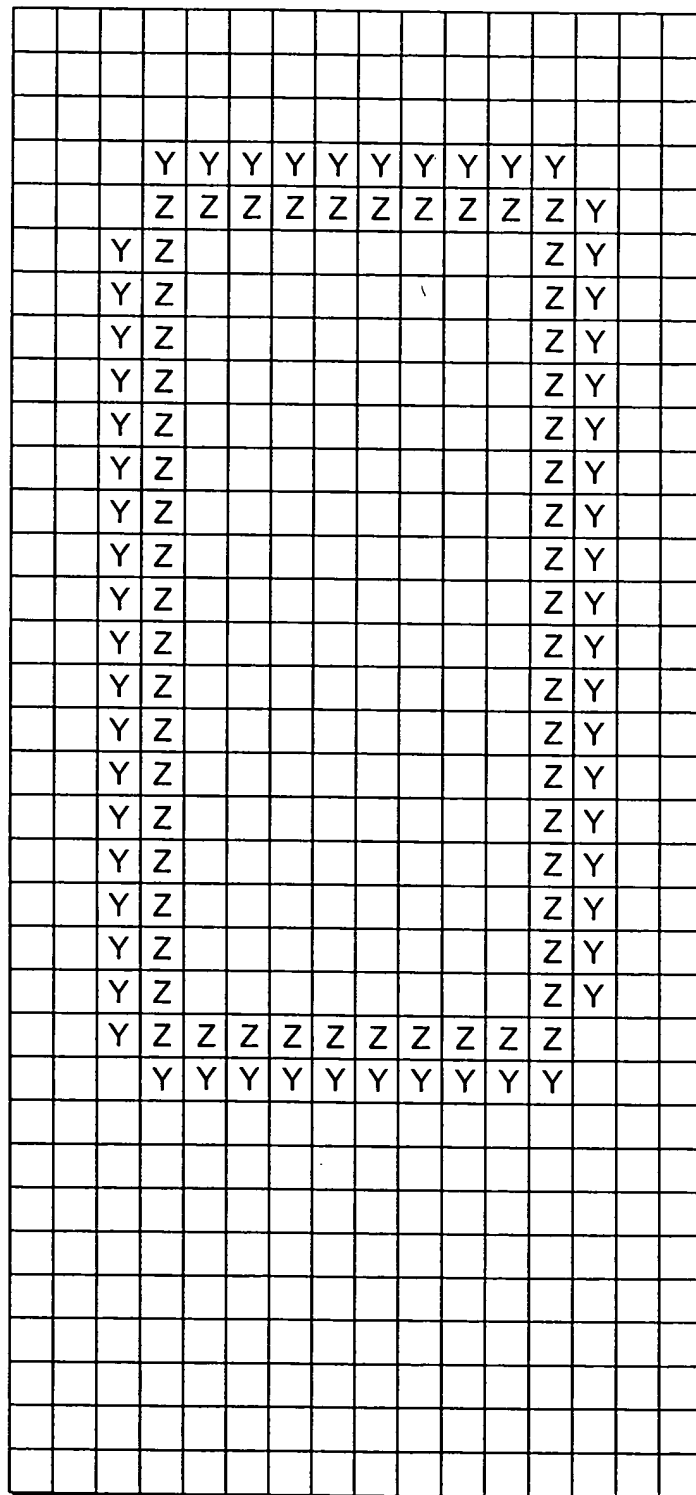


FIG. 10

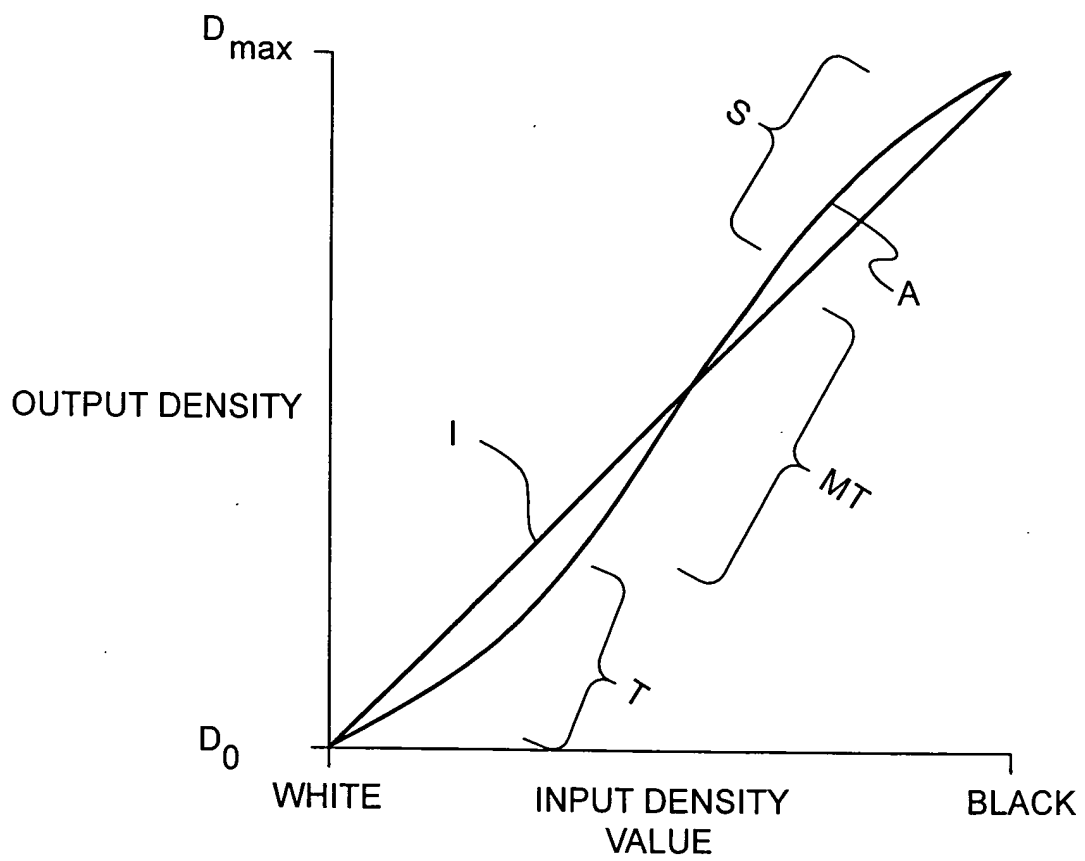


FIG. 11

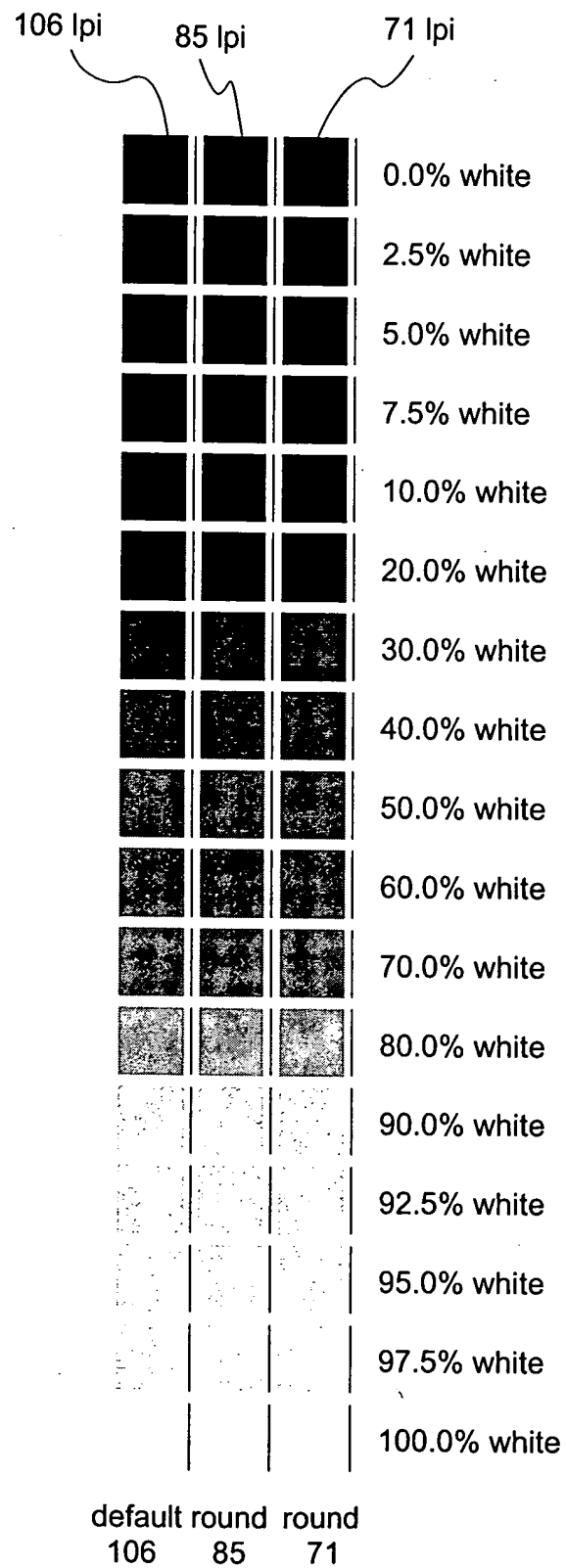


FIG. 12

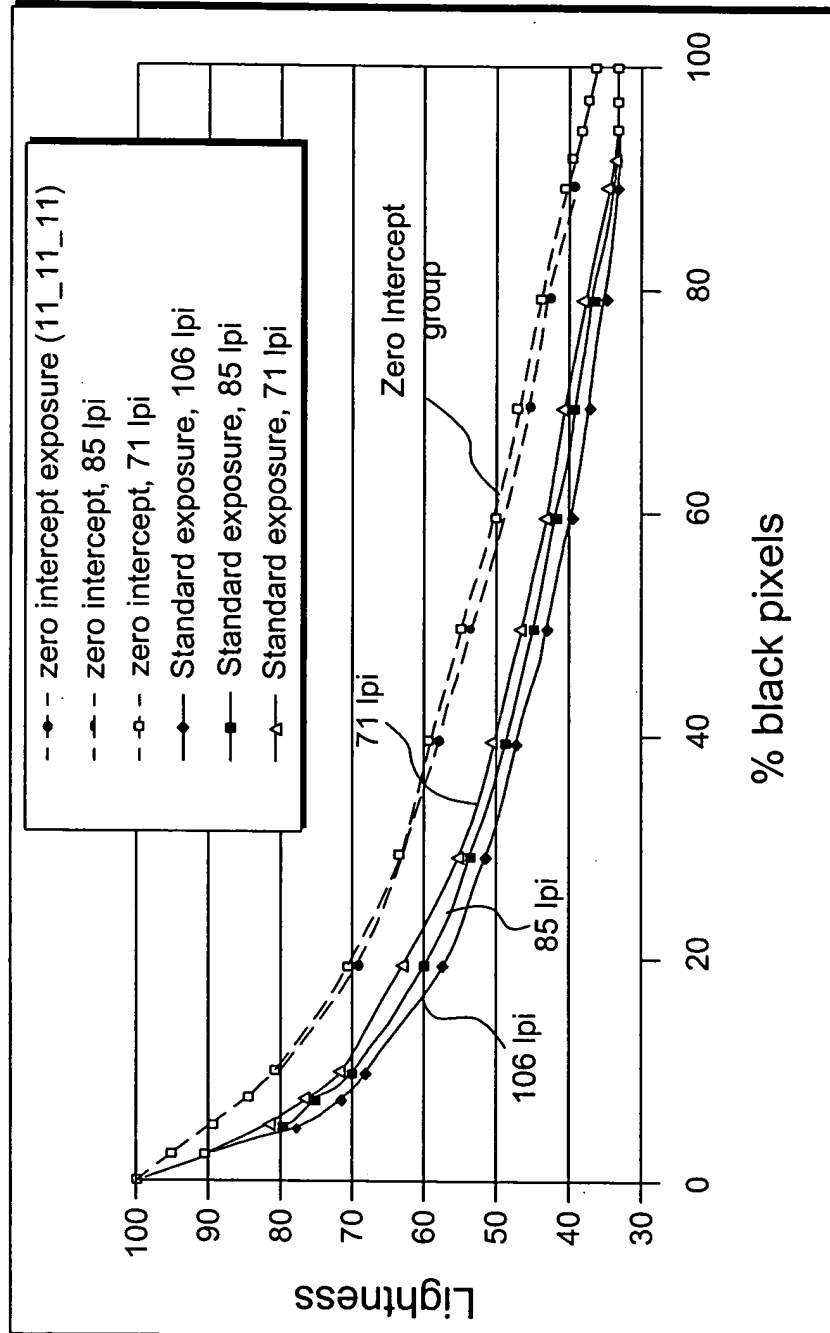


FIG. 13

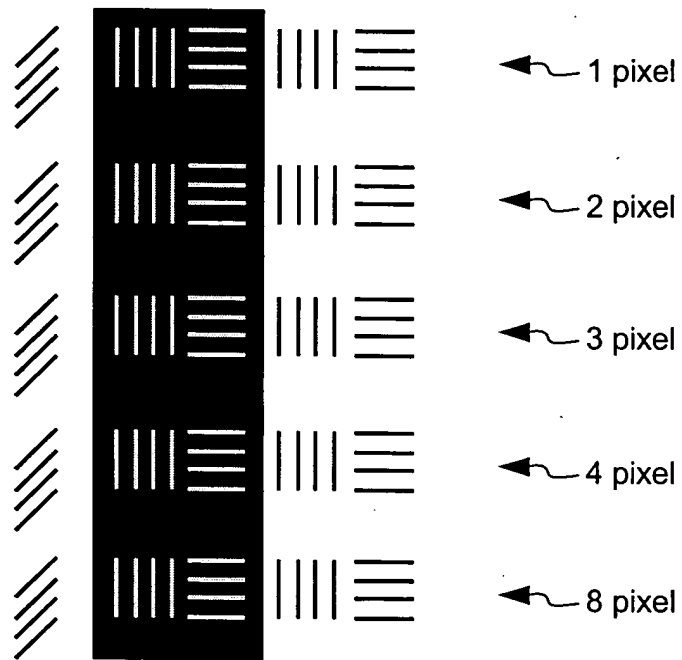


FIG. 14

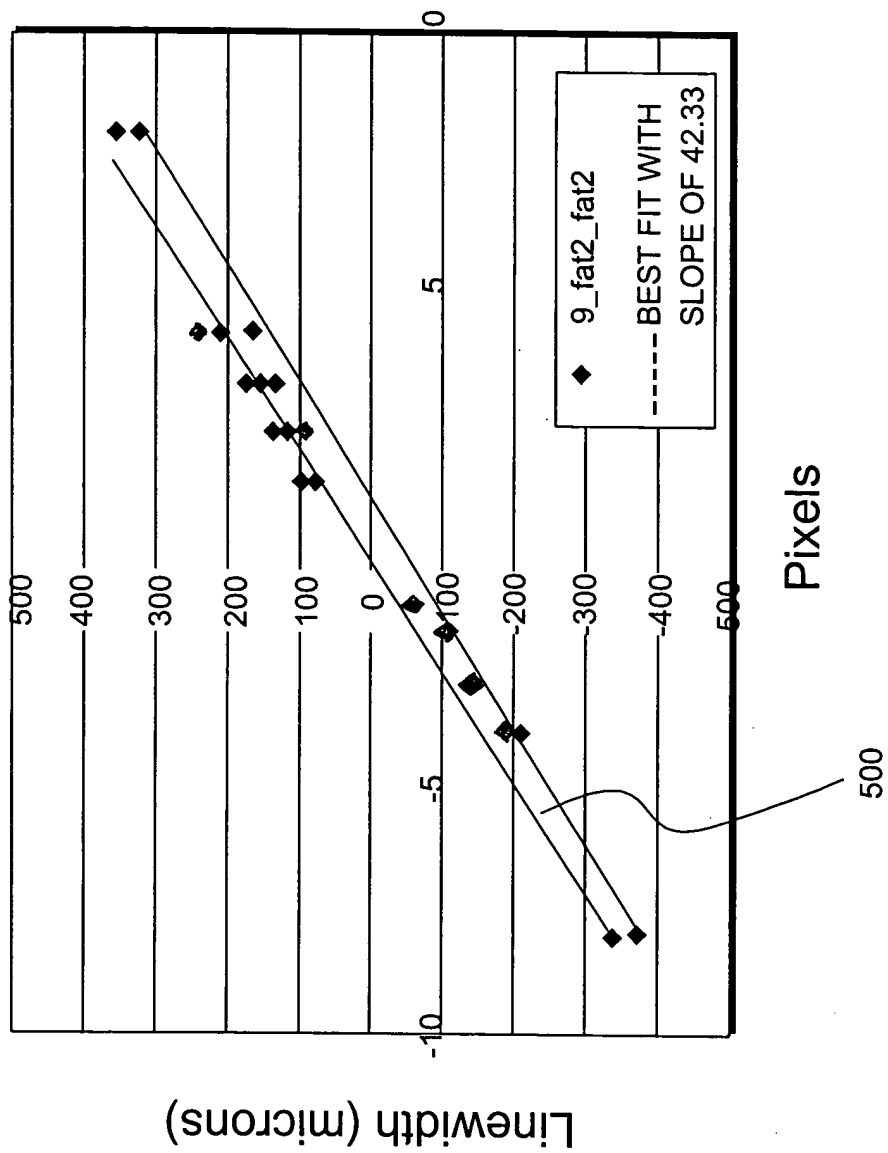


FIG. 15

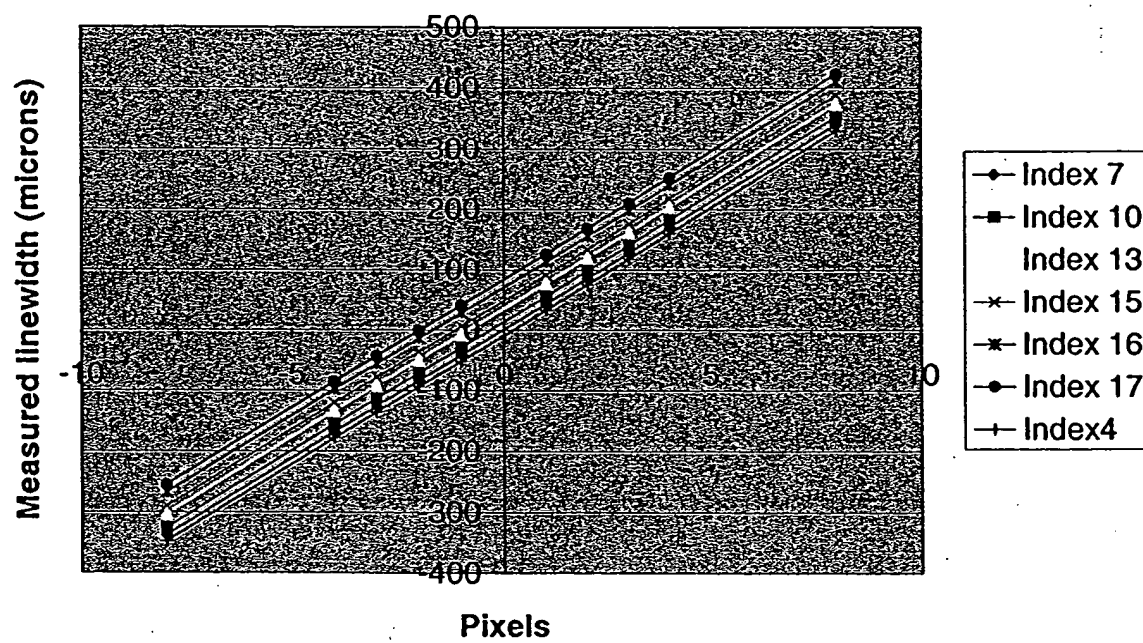


Fig. 16

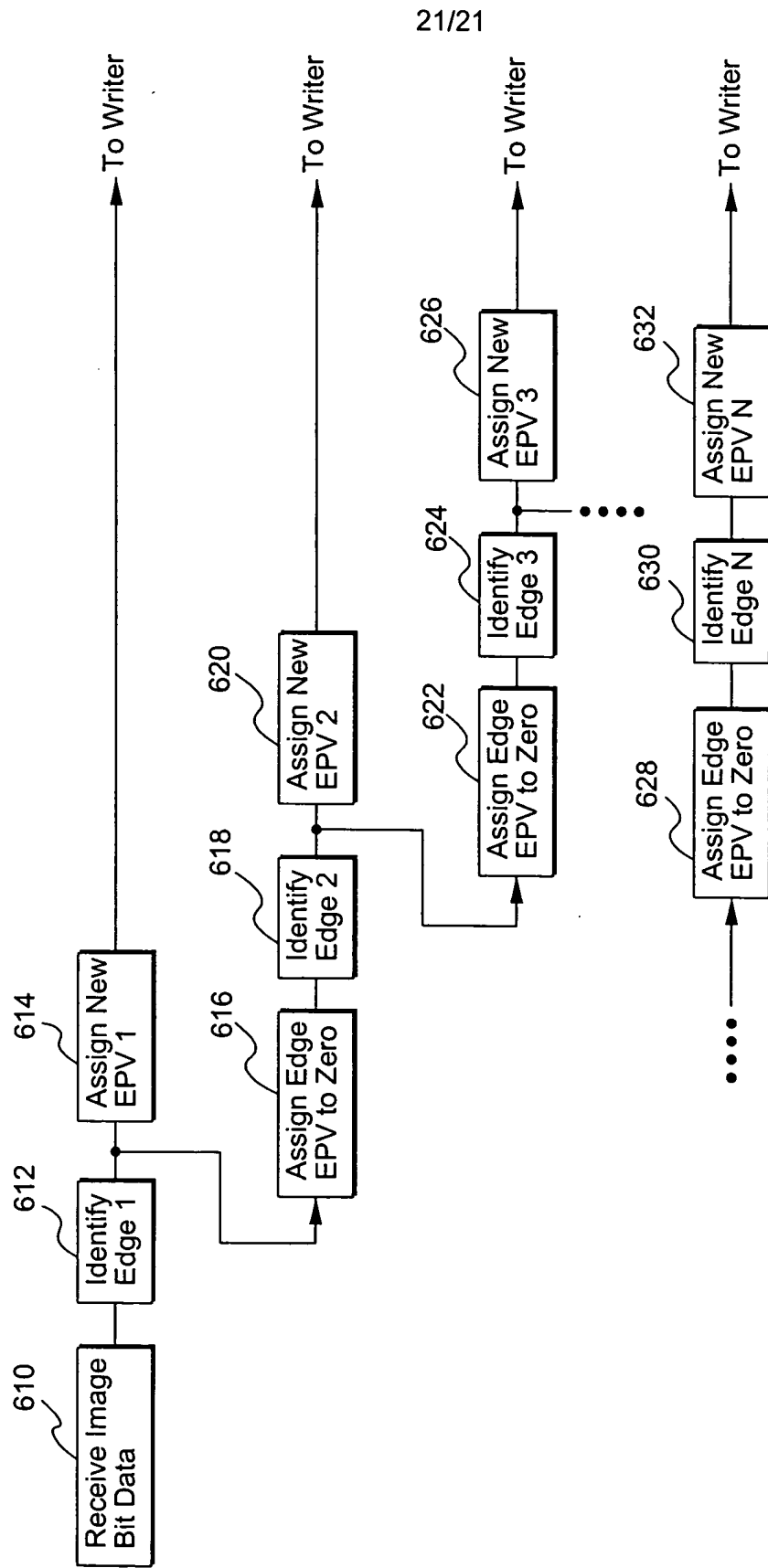


FIG. 17